

Multiple-Choice Test

Chapter 03.03 Bisection Method

1. The bisection method of finding roots of nonlinear equations falls under the category of a (an) _____ method.
 - (A) open
 - (B) bracketing
 - (C) random
 - (D) graphical
2. If $f(x)$ is a real continuous function in $[a,b]$, and $f(a)f(b) < 0$, then for $f(x) = 0$, there is (are) _____ in the domain $[a,b]$.
 - (A) one root
 - (B) an undeterminable number of roots
 - (C) no root
 - (D) at least one root
3. Assuming an initial bracket of $[1,5]$, the second (at the end of 2 iterations) iterative value of the root of $te^{-t} - 0.3 = 0$ using the bisection method is
 - (A) 0
 - (B) 1.5
 - (C) 2
 - (D) 3
4. To find the root of $f(x) = 0$, a scientist is using the bisection method. At the beginning of an iteration, the lower and upper guesses of the root are x_l and x_u . At the end of the iteration, the absolute relative approximate error in the estimated value of the root would be
 - (A) $\left| \frac{x_u}{x_u + x_l} \right|$
 - (B) $\left| \frac{x_l}{x_u + x_l} \right|$
 - (C) $\left| \frac{x_u - x_l}{x_u + x_l} \right|$
 - (D) $\left| \frac{x_u + x_l}{x_u - x_l} \right|$

5. For an equation like $x^2 = 0$, a root exists at $x = 0$. The bisection method cannot be adopted to solve this equation in spite of the root existing at $x = 0$ because the function $f(x) = x^2$
- (A) is a polynomial
 - (B) has repeated roots at $x = 0$
 - (C) is always non-negative
 - (D) has a slope equal to zero at $x = 0$

6. The ideal gas law is given by

$$pv = RT$$

where p is the pressure, v is the specific volume, R is the universal gas constant, and T is the absolute temperature. This equation is only accurate for a limited range of pressure and temperature. Vander Waals came up with an equation that was accurate for larger ranges of pressure and temperature given by

$$\left(p + \frac{a}{v^2}\right)(v - b) = RT$$

Where a and b are empirical constants dependent on a particular gas. Given the value of $R = 0.08$, $a = 3.592$, $b = 0.04267$, $p = 10$ and $T = 300$ (assume all units are consistent), one is going to find the specific volume, v , for the above values. Without finding the solution from the Vander Waals equation, what would be a good initial guess for v ?

- (A) 0
- (B) 1.2
- (C) 2.4
- (D) 3.6

[Complete Solution](#)